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Teaching Arithmetic in Grade Two

Erma Jean Laws

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TEACHING ARITHMETIC IN GRADE TWO

A THESIS

BY

ERMA JEAN LAWS

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TEACHING ARITHMETIC IN GRADE TWO

A THESIS

Presented to

the Faculty of the Graduate School

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by

Erma Jean Laws

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Erma Jean Laws

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CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS USED

Introduction. "Facts and "drill" are two words that for years characterized the emphasis in Grade Two Arithmetic. And there are still some teachers and supervisors today who believe that emphasis on "facts" and "drill" in Grade Two are both desirable and justifiable. They argue, the children should know addition and subtraction facts before they are taught the techniques of addition and subtraction. At a glance, such an attitude seems reasonable, but, do children "know" addition and subtraction facts in Grade Two? Isn't it true that teachers in Grade Three, in Grade Four, and in higher grades assume that there are children who do not "know" these facts?

A "fact" and "drill" program does not and cannot achieve expected results. Moreover, such a program actually interferes with the development of a program of meaningful arithmetic. In a meaningful program, arithmetical thinking replaces repetitive memorization and drill. A well-planned

classroom provides many experience situations for arithmetical emphasis.

All of us encounter the child who does not know how to apply arithmetical thinking to an arithmetic problem. Chances are he does not have the experience background needed to figure out essential processes, or, he may have some background which we neglect to call upon to help him understand the new challenge.

Children who are given an opportunity to discover arithmetical relationships in Grade Two are well along the way toward understanding the arithmetic in later grades. Further, future arithmetical learning will be more efficient than under a memoriter-type program since children will continue to develop the same set of relationships. In this way, the arithmetic learned earlier will be reinforced and children will be able to anticipate or think out more complex arithmetical situations.

I. THE PROBLEM

Statement of the problem. The problem which has been selected for study is "Teaching Arithmetic in Grade Two."

Limitations of the problem. The problem of this study was limited to the teaching of arithmetic on the second grade level at Nat Q. Henderson Elementary School, Houston Independent School District, School Year 1961-62.

Purposes of the study. The purposes of this study are: (1) to determine what number concepts the beginning second grader is expected to master; (2) to determine the extent of each child's understanding of the basic number concepts which were introduced at the first-grade level as a starting point for beginning second grade instruction; (3) to experience a period of instruction based on the needs of these findings in order to re-evaluate concepts; (4) to find out what authorities in the field consider good methods and materials of instruction; (5) to evaluate methods of instruction used by teachers in terms of authorities criteria of method.

Background of study. Arithmetic ought to be one of the exciting and real subjects of study. The writer fears, however, that in a zeal to move the children through the textbook and workbooks, an opportunity to use many concrete experiences were missed.

Thinking how to deal with arithmetic and creative teaching, the writer observed two nephews aged seven and nine, and discovered that children live arithmetic all day long. It would be difficult to name a single activity in daily living in which arithmetic does not play some part. Bicycle races in the backyard determine who's first, therefore, who produces the greatest speed. We play games where each child has to figure double and triple word scores as well as totals. We measure each child's height and weight. Nine has gained more than seven.

Thus, on and on goes the series of meaningful arithmetic experiences in the child's out-of-school day. All day long there is estimating, measuring, counting, dividing, saving, spending, telling time, counting of days and months to birthdays and holidays, shopping and number games of all sorts. Many more background experiences and concepts that the child brings to the second grade could be named. Is full use made of them?

Today both content and methods of teaching arithmetic in our schools are being seriously challenged. Such criticism seems to astonish many teachers, supervisors and administrators. These challenges are not new, however. For years, arithmeticians have been urging that certain basic principles

in arithmetic be developed in our schools.

A first step toward meeting the new challenges in grade two arithmetic teaching has been for the writer to rethink and reinterpret familiar terms such as these: problem solving, thinking, levels of maturity, relationships, concepts, meaning, discovery, generalizations, mental computation experiences, drill, practice, number counting and fundamental operations. Reinterpretation of terms such as these has involved viewing the classroom teaching-learning situation in new ways and thinking about the content of grade-school arithmetic in new ways.

It is the writers belief that through a study of this type, instructions in arithmetic can be improved. Through improvement of instructions, the writer will help pupils develop new powers which socialize him and put him on terms of closer cooperation with his companions.

II. DEFINITIONS OF TERMS USED

Meaningful arithmetic. A program which helps and encourages children to (1) grow in developing more and more mature arithmetical concepts, (2) perceive pertinent arithmetic in their classroom experiences, (3) make arithmetical

relationships through the use of appropriate materials, (4) think out arithmetical principles and generalizations.

Experience. Any actual activity as contrasted with a described or imagined one.

Base. A number on which a mathematical system depends: in Arabic notation, 10 is the base of the decimal system.[1]

Readiness. The point of development in a child where mathematical subject matter and problems are received with understanding and confidence.[2]

Meanings. The basic structure that gives significance to all computational skills.[3]

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[1] Funk & Wagnalls, Standard Dictionary of the English Language, International Edition, p. 117.

[2] Carter V. Good, Dictionary of Education, McGraw-Hill Book Company, Inc., 1959, p. 442.

[3] Ibid., p. 337.

CHAPTER II

REVIEW OF THE LITERATURE

In this chapter, the writer will present that material which is related to the study. Arithmetic should provide children with skills which will enable them to meet social situations where such skills are needed. There are basic facts and skills pertaining to the number system which have to be taught directly to pupils. These basic facts and skills are: (1) the number names, (2) order of names, (3) the written characters or symbols, (4) rational counting and the language of number relationships.[1]

I. LITERATURE ON ARITHMETIC CONCEPTS

Before number concepts can be taught, the child must possess readiness for arithmetic. Readiness for arithmetic can be approached in a number of ways. Three of which are: (1) evaluation by use of objective measuring instruments,

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[1]Lucy Lynde Rosenquist, Young Children Learn to Use Arithmetic, (Boston: Ginn and Company, 1949), p. 24.

(2) grade inventories, (3) the control-group and experimental-group procedure.[2] These approaches assume that "the whole" is no greater than "the sum of its parts," the whole being the learner's organized quantitative thinking at his level of maturation and the sum of the parts being his gross score on an objective test.

There is a misconception of arithmetic readiness. To many the term applies to the first grade level only, and is limited in its scope to readiness for abstract phases of arithmetic. Readiness is an important part of arithmetic at all grade levels. "When children are ready, they learn with relative ease."[3]

Meaning cannot be transmitted ready-made from one person to another. Real meanings are built within the learner's experience. "What children learn meaningfully stays with them better and is applied more successfully than what they learn by mere drill."[4] Drill should follow, not precede, the

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[2]John W. Dickey, "Readiness for Arithmetic," Elementary School Journal, XXXX, (September 1939 - June 1940), pp. 592-96.

[3]The Three R's in the Elementary School, Association for Supervision and Curriculum Development, Chapter V, p. 110.

[4]Robert L. Morton, "Teaching Arithmetic," N. E. A. Journal, Vol. 43 (1954), pp. 19-20.

development of meaning.

We often make a serious error in assuming that primary arithmetic consists of routine counting, reading and writing numerals and oral or written repetition of arithmetic facts. "Teachers in the primary grades have the responsibility to teach much more than the oral and written forms. They also need to teach the underlying and surrounding meanings of the concepts and processes which are merely significant by the forms."[5]

Logical sequence is an aid to number understanding. All children need not go through the same steps or stages in learning. Some easily make jumps, on the other hand, others not only need to take each step in a series, but need a longer period of time and additional planned experiences at each stage. The sequence best suited to the abilities of the children must be worked out by each teacher.

"To the child who had developed some sensitivity about numbers, the classroom is full of things that suggest groupings

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[5]Esther J. Swenson, "Making Primary Arithmetic Meaningful to Children," National Education Association, (April 1961), p. 43.

and natural divisions and invited estimation measurement and computation."[6]

Books on shelves, pencils and crayons in jars and books are familiar groupings. Locating pages in books and finding other rooms in the building creates a real need for reading and recognizing Arabic numerals. "It takes ingenuity to use situations creatively in the development of arithmetical understandings."[7]

II. LITERATURE ON METHODS OF TEACHING ARITHMETIC

Wilson explains the traditional method as having been extended beyond reasonable limits. The total results was to divert time from essential drill and to leave the child, finally, in a state of discouragement and confusion. An examination of textbooks published since 1900 shows the relationship between the development of arithmetic and the aims for which it is taught. The practical and disciplinary values compete for first consideration in every text.[8]

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[6] Esther Schatz, "Arithmetic," Childhood Education, Vol. 34, (1957-58), p. 106.

[7] Ibid.

[8] Guy M. Wilson, Teaching the New Arithmetic, (New York: McGraw-Hill Book Company, Inc., 1951), p. 14.

Buswell states that there is a place for drill in arithmetic. However, practice should follow, not precede, understanding. The old method of drilling on abstract number facts, without a concrete development of the facts, is gone from the modern program of arithmetic.[9] The function of practice is to increase efficiency of performance in operations which are already clearly understood. This practice has an important place in the teaching of arithmetic.

There are numerous methods of teaching certain concepts in arithmetic. Ida Mae Heard has written:

> A well-balanced program in arithmetic for the primary grades includes many opportunities for children to acquire concepts of measurement. Most teachers schedule some measurement experiences and capitalize on any unexpected situation that arises. Quite a number of teachers depend on the repetition of some worthwhile daily experience to give meaning to some phase of measurement, such as time and temperature.[10]

Some of the firsthand experiences which may be used to acquire measurement concepts are: (1) learning to tell time,

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[9] Fiftieth Yearbook of the National Society for the Study of Education, (Chicago: University of Chicago Press, 1951), p. 147.

[10] Ida Mae Heard, "Developing Concepts of Time and Temperature," The Arithmetic Teacher, VIII, (March 1961), p. 124.

(2) keeping a day-to-day calendar, (3) learning to read a thermometer, and (4) measuring evaporation of water.[11]

A peg board is an excellent arithmetic teaching aid. It will assist the teacher in presenting new concepts and help the students visualize these ideas in a concrete form.

Thomas J. Jennings states that most youngsters enjoy the challenge of riddles and puzzles. Jennings says that brain-teasers such as puzzles and riddles offer these values to children. (1) Old learnings in arithmetic and mathematics are applied in new ways. (2) Some youngsters take a real interest in arithmetic for the first time.[12]

In order to use the number line, children must face it and take steps to the right or to the left.[13] Edwina Deans states that the following understandings can be developed by using such a number line:

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[11] Alan A. Fisher, "The Peg-Board - A Useful Aid in Teaching Mathematics," The Arithmetic Teacher, VIII, No. 4, (April 1961), p. 186.

[12] Thomas J. Jennings, "Tease Them to Think," The Arithmetic Teacher, VIII, No. 5, (May 1961), p. 190.

[13] Edwina Deans, "A Number Line in the Classroom," The Arithmetic Teacher, VIII, No. 3, (March 1961), p. 246.

1. As you take steps to the right, the numbers become larger; as you take steps to the left, the numbers become smaller.

2. When you take two steps at a time you are counting by 2's. Counting by 2's requires skipping a number.

3. Two numbers may be added by starting with one number and stepping of the other.

   3+2=□

   Start at 3; move 2 steps to the right

   3+2=5

4. One number may be subtracted from another by starting with the total and moving to the left the number of steps indicated by the known addend.

   6-4=□

   Start at 6; move 4 steps to the left.

   6-4=2

5. Use of the number line helps children analyze problem-solving situations.

   There were 8 cookies in the box; we ate 6 of them. How many were left? Start at 8; move 6 steps to the left. Write the number sentence. 8-6=2

Two basic arithmetical concepts which must be taught well if arithmetic is to be meaningful are the concepts of base and a face value.

Teaching is the art of releasing the learner's power of creative thinking. It is also the science of challenging the learner to sense, discover, invent, experiment, text and formulate generalizations that result in well defined decisive action.[14]

The purpose of a child's learning any arithmetical meaning, skill, or information during the second grade is for solving his everyday problems, but the solution of these problems should be so developed that a maximum contribution is made to the number growth of the child.[15]

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[14] Marquerite Bydegaard, "New Adventures in Mathematics," The Instructor, (March 1961), p. 93.

[15] Clark, Ottis, and Hatton, Primary Arithmetic Through Experience. (New York: World Book Company, 1939), p. 93.

CHAPTER III

METHOD OF STUDY

In order to secure the necessary information for this study, the investigator used a number of achievement and diagnostic instruments. The "First Grade Handbook" was used to determine what concepts the beginning second grader should master and an arithmetic survey was used to diagnose the child's understanding of these concepts. After a period of instruction was experienced, another arithmetic survey was administered to test the understanding of concepts taught in the second grade.

The Stanford Achievement Test (Primary Battery, Form L), was administered to test the understanding and abilities in arithmetic reasoning and arithmetic computation at the end of the second grade. Twenty-nine children and fifteen second grade teachers employed by the Houston Independent School District were used in this study.

Through an extensive survey of professional literature, the writer was able to determine what authorities considered good methods and materials of instruction.

II. THE GROUP STUDIED

The group in this study consisted of twenty-nine pupils who were enrolled in the second grade at Nat Q. Henderson Elementary School in September, 1961.

Several days were spent in getting this group adjusted to their teacher and classmates. Then a general survey test was begun. It was used to diagnose the needs of the individual children. An attempt was made (1) to determine the background and variations of arithmetic readiness of the constituents of the group, (2) to discover needs and difficulties experienced in the use of materials on the second grade level, and (3) to evaluate certain techniques that would be helpful in resolving these needs and difficulties.

III. MATERIALS USED

Materials which were used during this study are listed below:

Picture-symbol cards and wall pockets

Flash Cards

Counting Frames

Bead Wires

Response Cards

Blocks

Counting sticks

Charts

Games

Blackboard

Number line

Yardstick and ruler

Real clocks and thermometer

Calendar

Play money and real money

Puzzles and games

Films and filmstrips

General surveys

Working with Numbers-Worktext

The Stanford Arithmetic Test
(Primary Battery Form L)

CHAPTER IV

BASIC NUMBER CONCEPTS

In this chapter, the writer will present that material which shows the results of all formal and informal tests used in this study. The best methods and materials of instruction which are considered by authorities are also presented. The results of a check list on methods and materials of instruction used by fifteen second grade teachers will also be found in this chapter.

When a child enters the second grade, his work in arithmetic becomes slightly more formal than he was accustomed to in his first school year.

There is no exact agreement as to how much arithmetic we should have in Grade One, but some authorities do agree that there should be a considerable amount and that it should not be rote memorization. It should be an arithmetic of discovery, thinking, and learning. The work of the second grade, then, must be centered around the everyday activities of the children, and should be so presented as to be as useful as possible.

The listings to follow will show that readiness for second grade arithmetic can be judged in terms of how well the pupil has demonstrated his ability to:

1. Count, read and write numbers 1 through 100
2. Understand relationships of numbers 1 through 10
3. Recognize numbers 1 through 10
4. Understand that ten ones make one ten; ten tens make one hundred; and that the order of tens is the same as the order of ones
5. Show some understanding of the "teens" numbers and other 2-place numbers from dictation
6. Use ordinal numbers first through sixth
7. Understand the relationship of the penny, nickle and dime
8. Understand how various things are bought and sold
9. Recognize a variety of measuring instruments and how they are used
10. Tell time to the even hour
11. Learn addition facts with sums through 6
12. Learn subtraction facts with sums through 6
13. Write addition and subtraction facts in correct alignment

14. Understand that one half means one of two equal parts

15. Show the meaning (use concrete material) and make written records (write the fact) of oral problems involving both addition and subtraction situations

16. Use these words and phrases in oral situations:

    More, more than, many, too many

    As much as, enough to make, the same number

    Less, fewer

    Big, little, large, small, larger, smaller, largest, smallest

    The number after, the number between, zero

    Add, and, are, addition

    Subtract, take away from, subtraction

    How much, how many

The listings above show the standard of achievement, or satisfactory progress for a pupil in arithmetic at the end of the first grade. If the child has accomplished these standards at the end of his first year in school, he is ready for a new phase of arithmetical learning.

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[16] A First Grade Guide, Curriculum Bulletin, Houston Independent School District, 1960, No. 60CBM19.

Before beginning the work of the second grade, it is necessary to find out what each individual child knows about numbers. In an effort to test the understanding of number concepts brought over from the first grade, the writer used a general survey test. It was devised in order that the writer may better meet the needs of each child within the group. This test was made in an informal manner with the children in a group situation.

Table I will show the results of the survey.

TABLE I

RESULTS OF AN ARITHMETIC SURVEY TEST
(Given during the fall semester of 1961)

CONCEPTS	SATISFACTORY EXTENT	%	FAIR EXTENT	%	UNSATISFACTORY EXTENT	%
1. Count by 1 to 100	25	86	3	10	1	4
2. Write by 1's to 50	21	72	4	14	4	14
3. Write by 10's to 100	23	80	3	10	3	10
4. Show the meaning of even 10's to 100	15	51	5	17	9	31
5. Read 2-place numbers	26	89	2	7	1	4
6. Write 2-place numbers from dictation	24	82	4	14	1	4
7. Show that addition is a process of making one group out of two groups (oral problems were used and pupil manipulated objects to show the meaning)	18	62	4	14	7	24
8. Show that subtraction is a process of taking one group from another known group	16	55	6	21	7	24

Table I shows the results of an arithmetic survey test given during the fall semester of 1961. The test was used to determine the extent of each child's understanding of number concepts taught in the first grade.

The items on this survey consisted of eight basic concepts. The criteria for scoring was set up into three categories: the satisfactory, the fair, and the unsatisfactory. The pupil was performing to a highly satisfactory extent if no errors were made, to a fair extent if the errors ranged from 1-3, and to an unsatisfactory extent if more than 3 errors were made.

The first concept tested was counting by 1's to 100. Eighty six per cent of the class scored satisfactory results, ten per cent scored fair results and four per cent scored unsatisfactory results. The second concept tested was writing by 1's to 50. The score for seventy two per cent of the class was satisfactory, fourteen per cent was fair and fourteen per cent was unsatisfactory.

Writing by 10's to 100 was the third concept evaluated. Eighty per cent of the scores were satisfactory, ten per cent were fair and ten per cent were unsatisfactory. The fourth

concept was evaluated by the pupils manipulating objects to show the meaning of even 10's to 100. The scores were: Fifty one per cent satisfactory, seventeen per cent fair, and thirty one per cent unsatisfactory. The class showed the highest percentage in the fifth concept tested. This concept was the reading of 2-place numbers. Eighty nine per cent of the class scored satisfactory, seven per cent scored fair and four per cent scored unsatisfactory.

Writing 2-place numbers from dictation made up the sixth concept. The scores were: Eighty two per cent satisfactory, fourteen per cent fair, and four per cent unsatisfactory. Objects were manipulated to show that addition is a process of making one group out of two. This made up the seventh concept. Sixty two per cent of the pupils' scores were satisfactory, fourteen per cent were fair, and twenty four per cent were unsatisfactory. The eighth concept was to show that subtraction is a process of taking one group from another known group. Fifty five per cent of the class scored satisfactory, twenty one per cent were fair and twenty four per cent were unsatisfactory.

Of the twenty-nine children tested, twenty of them had a good understanding of number concepts taught in the first

grade. Nine of them showed unsatisfactory results. It was concluded that the twenty who had a good understanding of first grade number concepts were ready to begin a new phase of arithmetic work. The nine who showed unsatisfactory results were given a variety of work experiences which were designed to enrich and strengthen their basic concepts in numbers.

A period of instruction was experienced based on the needs of the findings of the survey. During this period, the first grade concepts were reviewed. The number concepts which each child was expected to know by the end of the fall semester were introduced, analyzed and taught, also. The pupils who scored unsatisfactorily on the survey were constantly being reviewed over the basic number concepts and were given number work on their level of achievement. The remaining portion of the class were working numbers on their level of achievement.

At the end of the fall semester another general survey was given. It was given in an effort to test and evaluate concepts which were taught during the first semester of second grade work. The criteria for grading was the same as it was for the first survey test. 0 errors, satisfactory,

1-3 errors fair, and more than 3 errors unsatisfactory.

Table II will show the findings of the second survey test which was administered.

TABLE II

RESULTS OF FOLLOW UP GENERAL SURVEY TEST
(Given in the Spring of 1962)

CONCEPTS	SATISFACTORY EXTENT	%	FAIR EXTENT	%	UNSATISFACTORY EXTENT	%
1. Write by 1's to 100	23	79	4	14	2	7
2. Count and write by 2's to 21 beginning with 1	24	83	2	7	3	10
3. Count and write by 2's to 20 beginning with 2	20	69	4	14	5	17
4. Show the meaning of teen numbers	19	66	6	20	4	14
5. Show the meaning of 2-place numbers	20	69	7	24	2	7
6. Write the sums at sight for the 17 addition facts involving adding 1	18	62	7	24	4	14
7. Write the sums at sight for the 17 addition facts involving adding 2	18	62	7	24	4	14

TABLE II CON'T.

CONCEPTS	SATISFACTORY EXTENT	%	FAIR EXTENT	%	UNSATISFACTORY EXTENT	%
8. Write the remainders at sight for the 17 subtraction facts involving subtracting 1 and all but 1	9	31	4	14	16	55
9. Write the remainders at sight for the 17 subtraction facts involving subtracting 2 and all but 2	8	28	8	28	13	44
10. Write addition and subtraction facts for problem situations	24	83	2	7	3	10
11. Write addition and subtraction facts (numbers written in correct alignment)	19	66	5	17	5	17
12. Write 1-place and 2-place numbers from dictation (in a column)	3	10	8	28	18	62

Table II shows the results of a general survey test which was given at the end of the first semester's work in grade two. The test was administered in an effort to determine each child's understanding of the concepts taught during the fall semester of second grade work.

Writing by 1's to 100 was the first concept to be tested. Seventy nine per cent of the scores were satisfactory, Fourteen per cent of the scores were fair and seven per cent of them were unsatisfactory.

The second and third concepts were to count by 2's to 21 beginning with 1, and to count by 2's to 20 beginning with 2. The scores for the second concept were: Eighty three per cent satisfactory, seven per cent fair and ten per cent unsatisfactory. The scores for the third concept were: Sixty nine per cent satisfactory, fourteen per cent fair and seventeen per cent unsatisfactory. The counting frame and bundles of sticks were used to show the meaning of teen numbers. This made up the fourth concept. Sixty six per cent of the class made no errors, twenty per cent made from 1-3 errors, and fourteen per cent made more than 3 errors. The fifth concept was to show the meaning of 2-place numbers. The counting

frame and sticks were used to test this concept also. The scores were: sixty nine per cent satisfactory, twenty four per cent fair, and seven per cent unsatisfactory.

Flash cards were used to test the sixth concept. Each pupil had to write the sums at sight. For the 17 addition facts involving adding 1 to a number, sixty two per cent showed satisfactory results, twenty four per cent showed fair results and fourteen per cent showed unsatisfactory results. In the seventh concept, the pupil's ability to write the sums at sight for the 17 addition facts which involved adding 2 to a number was tested. The percentages were as follows: sixty two per cent was satisfactory, twenty four per cent was fair and fourteen per cent was unsatisfactory.

Each child's ability to write the remainders at sight for the 17 subtraction facts involving adding 2 to a number was evaluated. A large percentage of the class scored very low on this concept. Thirty one per cent of the scores were satisfactory, fourteen per cent were fair and fifty five per cent were unsatisfactory. There was a very slight increase in the percentages for the ninth concept to be evaluated. This concept involved writing the remainders at sight for the 17 subtraction facts involving subtracting 2 and all but 2

from a number. The percentages were twenty eight per cent who showed fair results, twenty eight per cent satisfactory and forty four per cent showed unsatisfactory results.

A vast majority of the class showed satisfactory results in their ability to master the tenth concept. This concept tested the pupil's ability to write addition and subtraction facts for problem situations. Eighty three per cent showed satisfactory results, seven per cent showed fair results, and ten per cent showed unsatisfactory results. The problems for this concept were read by the investigator. The purpose of this exercise was to check the pupil's ability to associate the addition and subtraction processes with problem situations.

Each pupil was required to write addition and subtraction facts from dictation. This was the component of the eleventh concept. The numbers had to be written in correct alinement for the results to be considered satisfactory. The results were: sixty six per cent showed satisfaction, seventeen per cent showed a fair understanding and seventeen per cent showed an unsatisfactory understanding.

The pupil's ability to write 1-place and 2-place numbers from dictation made up the twelfth concept. The purpose of this exercise was to check the pupil's understanding of the

principle of place value. Ones had to be written under ones and tens under tens for the results to be considered correct. Ten per cent of the group tested scored satisfactory results, twenty eight per cent scored fair results and sixty two per cent scored unsatisfactory results.

On the basis of these findings it was concluded that eighteen of the children were ready for more complicated work. They were introduced to arithmetic work which required the development, the use, and the understanding of greater skills. The eleven who showed fair and unsatisfactory results were given extra arithmetic work to strengthen their weaknesses. The concepts on which they did not show good understanding were reviewed and re-taught. After a period of review and re-teaching, these eleven pupils had progressed enough to be considered for promotion.

However, before the close of the spring semester, the writer tested each of the twenty nine pupils under observation to determine how many of them were ready to do third grade work in arithmetic. The Stanford Achievement Test, Primary Battery, Form L. was used for this evaluation. Table III will show the findings of this diagnostic test.

TABLE III

RESULTS OF THE STANFORD ACHIEVEMENT TEST
Primary Battery, Form L

GRADE EQUIVALENTS																	
ARITHMETIC REASONING						ARITHMETIC COMPUTATION						AVERAGE ARITHMETIC READINESS					
1.5 - 2.0		2.1 - 2.8		2.9 - 3.0		1.6 - 2.0		2.1 - 2.8		2.9 - 3.4		1.6 - 2.0		2.1 - 2.8		2.9 - 3.4	
9	31%	11	38%	9	31%	2	7%	13	44%	14	49%	2	7%	16	55%	11	38%

Table III shows the results of the Stanford Achievement Test in the form of grade equivalents and class percentages. The scores and grade equivalents range from 1.5 to 3.9 in arithmetic reasoning, from 1.6 to 3.4 in arithmetic computation and from 1.6 to 3.4 in the average arithmetic abilities. The class percentage for arithmetic reasoning was thirty one per cent for the nine whose score ranged from 1.5 to 2.0, thirty eight per cent for the eleven whose score ranged from 2.1 - 2.8, and thirty one per cent for the nine whose score ranged from 2.9 - 3.0. The percentage for arithmetic computation was seven per cent for the two whose grade equivalent was between 1.6 - 2.0, forty four per cent for the two whose grade equivalent was between 2.1 - 2.8, and forty nine per cent for the fourteen whose grade equivalent was between 2.9 - 3.4. The class percentage for their total arithmetic readiness was: seven per cent for the two pupils with grade equivalents of 1.6 - 2.0, fifty five per cent for the sixteen who scored grade equivalents of 2.1 - 2.8, and thirty eight per cent for the eleven who scored grade equivalents of 2.9 - 3.4.

The pupils who scored 2.0 and below were not ready to assume the work of a third grader in arithmetic. These scores

indicates that they are just ready for second grade work. The pupils whose grade equivalent is between 2.1 and 2.8 have a fair understanding of the concepts taught in the second grade. For some of these pupils, arithmetic work on the third grade level will be complicated. The pupils whose scores ranged from 2.9 to 3.9 thoroughly understand the concepts taught in the second grade. Their chances are good for a successful year of work in the third grade.

METHODS AND TECHNIQUES OF INSTRUCTION

Instruction during the second grade starts where the instruction of the first grade left off and the methods are closely integrated. However, in arithmetic as in all other subject-matter fields, methods of teaching will vary depending upon the objectives and the standards which are set up.

Wilson states that two main facts determine the method of teaching. They are the nature of the subject matter, and the nature of the child.

The different types of subject matter are the basis for what may be called the "major techniques" - drill, problem and appreciation.[17]

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17 Guy M. Wilson, op. cit., pp. 41-44.

If a high degree of memorization is sought, drill is the proper technique to use; the problem technique should be used if the aim is judgement; and appreciation is the technique to use if the aim is enjoyment. The teacher of arithmetic should use all of the major techniques.

Brownell[18] discusses four kinds of approaches in the teaching of arithmetic. They are: (1) the incidental approach, (2) the social approach, (3) the drill approach, and (4) the meaningful approach. He states that the mathematical meaning of a number is not taught if the teacher depends upon drill merely to fixate a fact. There must be a difference between meaningless drill and enlightened drill.

The social approach attempts to make arithmetic functional by using activities rich in arithmetic which are actual child experiences.

The meaningful emphasizes both the social application and the arithmetical relationship of a number.

"The method and techniques of arithmetic instruction should be planned, systematic, and sequential."[19]

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[18] W. A. Brownell, and others, Arithmetic in Grades I and II, (Durham, North Carolina, Duke University Press, 1941), pp. 6-8.

[19] Gertrude Hildreth, Learning the Three R's, Second Edition, (Nashville, Tenn.: Educational Publishers, Inc., 1947), p. 45.

In order to do an effective job of teaching, different methods of instruction must be used. There is no "set method of instruction." Table IV will show some methods and techniques of instruction and the authorities who advocate the use of them.

TABLE IV

METHODS OF INSTRUCTION

	Bydegaard		Bruckner		Grossnickle		Wilson		Brownell		Hildreth	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Social approach only		X		X		X		X		X		X
2. Drill only		X		X		X		X		X		X
3. Meaningful approach only		X		X		X		X		X		X
4. Problem technique only		X		X		X		X		X		X
5. Appreciation technique only		X		X		X		X		X		X
6. A combination of methods mentioned above	X		X		X		X		X		X	

Through an extensive study of literature, the writer discovered different methods and techniques of instruction which were advocated by various authorities in the field of arithmetic.

The authorities and the approaches of which they advocate are listed in Table IV. The authorities are Marguerite Brydegaard, Leo J. Brueckner, Foster E. Grossnickle, Guy M. Wilson, William A. Brownell and Gertrude Hildreth. Their approaches and techniques include the social approach, the drill approach, the problem technique, and a combination of all the methods mentioned above.

None of the authorities mentioned considered the use of a "set method" of instruction. It was agreed that in order to do an effective job of teaching arithmetic, all of the techniques mentioned in Table IV, must be used. None of these methods should be isolated. Instead, they should be flexible and used interchangeably. The pupil should not be stifled by insistance of a "set method."

MATERIALS OF INSTRUCTION

In selecting materials of instruction, the teacher should keep in mind the interest and aptitudes of the pupils, the

differences in their needs and the standards to be achieved. The modern arithmetic program should include materials which are found both in the school itself and in social life outside the school.

Various authorities in the field of arithmetic have agreed upon the following materials of instruction.

TABLE V

MATERIALS OF INSTRUCTION IN ARITHMETIC

	Fisher	Bruckner	Grossnickle	Wilson	Heard	Jennings	Dean
1. Concrete objects	X	X	X	X	X	X	X
2. Instruments of measurement		X	X		X		
3. Drill material		X	X	X	X	X	
4. Textbooks and workbooks		X	X	X			
5. Films and Film-strips		X	X				
6. Number line							X
7. Peg Board	X						
8. Excursions and field trips		X	X				

The preceding table shows that a variety of instructional material should be used in order to make work in arithmetic more meaningful and vital to each pupil. The materials which are listed in Table V, include the use of concrete objects, instruments of measure, drill material, textbooks and workbooks, films and filmstrips, the number line, a peg board, and excursions or field trips.

Each authority who has been listed is a strong advocator of the use of concrete objects. However, there is a difference of opinion for the use of the other materials listed. In addition to the use of concrete objects, Fisher suggests the use of peg boards. Brueckner and Grossnickle suggest the use of drill materials, instruments of measure, textbooks and workbooks, films and filmstrips, the peg board, and field trips or excursions. Wilson is an advocator of drill material and textbooks and for workbooks, also. Heard advocates the use of drill materials and instruments of measurements. Jennings also favors the use of drill material, whereas, Deans prefers the number line.

Some of the items which can be considered as concrete objects are: buttons, sticks, blocks, chairs, tops, beads and grouping or counting other tangible items. Measuring

devices are thought of as: a ruler, a yardstick, a clock, scales, a thermometer and quart, pints, and one-half pint jars or boxes. Drill materials should be thought of as: flash cards, games, picture symbol cards, wall pockets and perception cards.

The films and filmstrips which are used in an arithmetic class must be ones through which an arithmetical concept can be strengthened or introduced for the pupil. Excursions and field trips should be thought of and used for the same purpose as the films and filmstrips. After the class has returned to the schoolroom, dramatizations of things observed on the field trip will be beneficial to the children. These dramatizations can include such things as telephoning, making change, paying library fees, and finding the cost of mailing a letter.

These and other materials should be used as resources to enrich the learning activities.

In an effort to determine the method and materials of instruction used by various second grade teachers, the checklist to follow was devised and mailed to fifteen teachers. The checklist served as an instrument to evaluate methods and materials of instruction used by them in terms of methods used by various authorities.

TABLE VI

RESULTS OF CHECKLIST USED TO EVALUATE METHODS AND MATERIALS OF INSTRUCTION

Methods	Frequency of Teacher Responses
Social approach	15
Drill approach	15
Appreciation techniques	13
Problem technique	15
Picture and visual aids	15

Materials	Frequency of Teacher Responses
Concrete objects	15
Instruments of measure	15
Drill material	15
Textbook or workbook	15
Film or filmstrips	10
Number line	15
Excursions and field trips	4
Dramatizations	15

Table VI shows the result of a checklist which was used by fifteen second grade teachers in evaluating their methods and materials of instruction in terms of those suggested by various arithmetic authorities. It was found that none of these teachers used a set method of instruction. Instead, all of the methods mentioned on the checklist were used at different intervals.

In evaluating methods, the social and drill approaches, as well as the problem and picture and visual aids techniques, were used by all of these teachers. The appreciation technique which sets its aim at enjoyment, was used by only thirteen of the fifteen teachers used in this study. In evaluating the use of materials, it was found that concrete objects, instruments of measure, drill material, textbooks, the number line and dramatizations were used by all of these teachers. Excursions or field trips were used by only four of the teachers, and films or filmstrips were used by ten of them. Each of the teachers' methods and materials of instruction were found to be very flexible.

In order to make arithmetic more meaningful to each pupil, all of these materials and methods of instruction should be

used at different intervals. The child should be given every opportunity to grow in developing more and more mature mathematical concepts.

It was found that none of the fifteen teachers who used this check list employs a "set method" of instruction. Instead, all of the methods mentioned above are used at different intervals.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was concerned from the beginning with finding out (1) what authorities in the field considered good methods and materials of instruction; (2) evaluating methods and materials used by other second grade teachers in terms of the suggestions made by authorities; (3) determining the extent of each child's understanding of the basic number concepts taught in the first grade, and (4) determining what number concepts the beginning second grader should master. To accomplish these purposes, the writer used the "First Grade Handbook" to determine what number concepts the beginning second grader should master and an arithmetic survey to diagnose the child's understanding of the concepts introduced at the first grade level. The Stanford Achievement Test was used at the end of the second grade to test the understanding of concepts taught by the writer, and through an extensive survey of professional literature, the writer was able to ascertain what authorities considered good methods

and materials of instruction.

The following paragraphs will summarize the findings of the study.

(1) The various authorities agreed that there is no exact agreement as to how much arithmetic one should have in Grade One, but there should be a considerable amount and it should not be rote memorization. It should be an arithmetic of discovery, thinking, and learning.

(2) Twenty-nine children were surveyed in an effort to determine the extent of each child's understandings of number concepts taught in the first grade. The survey revealed that twenty of these children had a good understanding of the concepts, and nine of them showed unsatisfactory results.

(3) The Stanford Achievement Test was the instrument used to evaluate the understanding of number concepts taught in the second grade. This diagnostic test was used in an attempt to determine how many of the children were ready to assume the work of the third grade in arithmetic. It was found that the total arithmetic readiness of seven per cent of the class was unfavorable. Fifty five per cent showed

satisfactory readiness and thirty eight per cent were superior in their readiness.

(4) An extensive and intensive survey of professional literature revealed that there are four kinds of approaches in teaching arithmetic. They are (a) the meaningful approach; (b) the social approach; (c) the drill approach; (d) the problem technique, and (e) the appreciation technique. These methods or approaches in teaching arithmetic should be used interchangeably.

(5) Various authorities in the field of arithmetic agreed upon the use of the following materials of instruction: concrete objects, instruments of measure, drill material, textbooks or workbooks, films and filmstrips, a number line, a peg board and excursions or field trips.

Conclusions. After examining the findings of this study, it was concluded that:

1. The school should not only develop mastery of concepts, but should provide opportunity for the application and utilization of the skills and processes.

2. The teacher must provide learning situations.

3. Twenty of the twenty-nine children who were under observation had a good understanding of number concepts taught in the first grade, but nine of them were not ready to be introduced to a new phase of arithmetic.

4. In order to do an effective job of teaching arithmetic, there should be a wide range in the use of various methods and materials of instruction.

Recommendations. The writer recommends that: (1) Arithmetic should begin in Kindergarten with many varied elementary experiences of size, shape and numbers to provide the basis for later and more formal work; (2) Full utilization should be made of the number concepts already possessed by a child; (3) Actual experiences should be utilized in order to give number meanings to children; and (4) Do not rush into drill, instead, spend more time in thinking and understanding in the early stages, and then practice for retention.

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APPENDIX

Check List for Methods and Materials of Instruction

Used in Teaching Numbers

Directions: You will note that some of the methods and materials of instruction are listed below. In using the check list, indicate the methods and materials which are most characteristic of your instruction.

Methods

1. Social approach _____
2. Drill approach _____
3. Appreciation technique _____
4. Problem technique _____
5. Picture and visual aids method _____

Materials

1. Concrete objects _____

   Grouping and counting chairs, buttons, sticks, blocks, and other objects which make numbers meaningful

2. Instruments of measure _____

   Quantity, length, time, value, width, weight, volume, and temperature

3. Drill material _____

   Flash cards, bead wires, response cards, games, picture symbol cards and wall pockets

4. Textbook or workbook _____

5. Film and Filmstrips _____

6. Number line _____

7. Excursions and field trips _____

8. Dramatizations _____

   Telephoning, making and checking change, paying library fees, and finding the cost of mailing a letter

ARITHMETIC SURVEY

FALL SEMESTER

GRADE 2

School_____ Date_____

Number of pupils in room_____

To a highly satisfactory extent (0 errors)

To a fair extent (1-3 errors)

To an unsatisfactory extent (more than 3 errors)

	No. of pupils
1. Count by 1's to 100	_____
Satisfactory	_____
Fair	_____
Unsatisfactory	_____
2. Write by 1's to 50	
Satisfactory	_____
Fair	_____
Unsatisfactory	_____
3. Write by 10's to 100	
Satisfactory	_____
Fair	_____
Unsatisfactory	_____

*4. Show the meaning of the even 10's to 100. (Use bundles of sticks, counting frame, etc.)

Satisfactory _____

Fair _____

Unsatisfactory _____

5. Read 2-place numbers (10 numbers will be a satisfactory sample).

Satisfactory _____

Fair _____

Unsatisfactory _____

6. Write 2-place numbers from dictation (10 numbers will be a satisfactory sample).

Satisfactory _____

Fair _____

Unsatisfactory _____

*This portion of the test can be given to about 10 children at at time because the teacher can easily observe this number of children as they manipulate materials.

*7. Show that addition is a process of making one group out of two groups. (Use 6 oral problems and have pupils manipulate materials to show what each problem means.)

Satisfactory _____

Fair _____

Unsatisfactory _____

*8. Show that subtraction is a process of taking one group from another known group. (Use 6 oral problems and have pupils manipulate materials to show what each problem means)

Satisfactory _____

Fair _____

Unsatisfactory _____

*This portion of the test can be given to about 10 children at a time because the teacher can easily observe this number of children as they manipulate materials.

ARITHMETIC SURVEY

SPRING SEMESTER

GRADE 2

School_____ Date_____

Number of pupils in room_____

	No. of pupils
1. Write by 1's to 100.	_____
Satisfactory	_____
Fair	_____
Unsatisfactory	_____
2. Count and write by 2's to 20 beginning with 2.	
Satisfactory	_____
Fair	_____
Unsatisfactory	_____
3. Count and write by 2's to 21 beginning with 1.	
Satisfactory	_____
Fair	_____
Unsatisfactory	_____

4. Show the meaning of the teen numbers.

No. of pupils

(Use counting frame, sticks, etc. Five numbers will be a satisfactory sample).

Satisfactory _____

Fair _____

Unsatisfactory _____

5. Show the meaning of 2-place numbers. (Use counting frame, sticks, etc.)

Satisfactory _____

Fair _____

Unsatisfactory _____

*6. Write the sums at sight for the 17 addition facts involving adding 1.

Satisfactory _____

Fair _____

Unsatisfactory _____

*7. Write the sums at sight for the 17 addition facts involving adding 2.

Satisfactory _____

Fair _____

Unsatisfactory _____

*Watch closely to see that pupils do not count. Perhaps the best way to do this is to use flash cards and have pupils write only the sums or remainders.

*8. Write the remainders at sight for the 17 subtraction facts involving subtracting all but 1.

Satisfactory _____

Fair _____

Unsatisfactory _____

*9. Write the remainders at sight for the 17 subtraction facts (15 new facts) involving subtracting 2 and subtracting all but 2.

Satisfactory _____

Fair _____

Unsatisfactory _____

10. Write the following 1-place and 2-place numbers from dictation. (The purpose of this exercise is to check the pupil's understanding of the principle of place value. Ones must be written under ones and tens under tens for the results to be considered satisfactory).

4	17	5	16
41	2	60	61
62	6	8	9
7	30	29	3

Satisfactory _____

Fair _____

Unsatisfactory _____

*Watch closely to see that pupils do not count. Perhaps the best way to do this is to use flash cards and have pupils write only the sums or remainders.

11. Write addition and subtraction facts from dictation. (The numbers must be written in proper alinement for the results to be considered satisfactory).

5	2	6	10	8	11
+3	+7	+4	-1	-3	-9

Satisfactory _____

Fair _____

Unsatisfactory _____

12. Write addition and subtraction facts for problem situations. (These problems are to be read by the teacher. The purpose of this exercise is to check the pupil's ability to associate the addition and subtraction processes with problem situations; therefore, in evaluating this exercise the answer is to be disregarded).

a. John saw 2 red birds and 3 blue birds. How many birds did he see in all?

b. Ann had 5 cookies. She gave 2 to Jane. How many cookies did she have left?

c. Joe had 10 pennies. He spent 2. How many did he have left?

d. Sue had 7 dolls and Grandmother gave her 2 more. How many did she have then?

Satisfactory _____

Fair _____

Unsatisfactory _____

Primary Battery | FORM L

STANFORD ACHIEVEMENT TEST

TRUMAN L. KELLEY • RICHARD MADDEN • ERIC F. GARDNER • LEWIS M. TERMAN • GILES M. RUCH

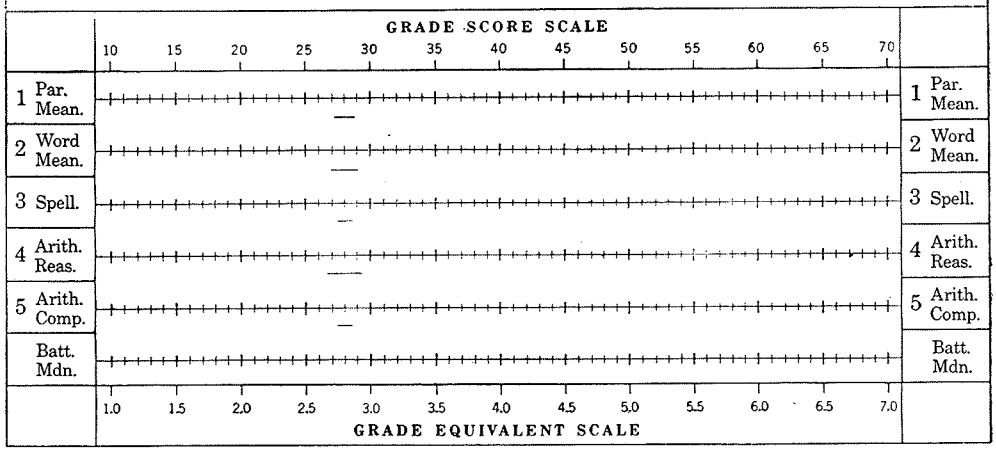
Name_____ Age_____ Grade_____ Boy or girl_____

Teacher_____ School_____ Date of birth_____ _____ _____
Year *Month* *Day*

City or town_____ State_____ Date_____

	1 PAR. MEAN.	2 WORD MEAN.	AVER. READ.	3 SPELL.	4 ARITH. REAS.	5 ARITH. COMP.	AVER. ARITH.	BATTERY MEDIAN
Grade Equiv.								
Age Equiv.								
%-ile Rank								

Individual Profile Chart



TEST 1 *Paragraph Meaning*

DIRECTIONS: Find the one word that belongs in each space, and draw a line under the word. Do *not* write in the spaces.

SAMPLES:

Baby pets me.
I drink milk.
I say "Mew, mew."
I am a __51__.

51. cow **kitten** pony child

Tom had two apples. Fred had four cookies. Fred said, "I will give you two __52__ if you will give me one of your __53__."

52. oranges **cookies** cakes bananas
53. apples oranges bananas cakes

I am big.
I eat grass.
I give milk.
I am a __1__.

1. farm cow bottle bug

The little baby likes to __2__.

2. play read talk sing

There is only one white cloud in the __3__ sky.

3. white green blue yellow

I am yellow.
I am good to eat.
You put me on bread.
I am __4__.

4. milk butter dinner lunch

I give light.
I make you hot.
You see me in the sky.
I am the __5__.

5. sun rain wind snow

It is nice to see a boy __6__ his mother.

6. hurt help bite hit

I am round.
I am made of rubber.
I bounce when I fall.
I am a __7__.

7. boot band ball coat

Bob has a flower garden.
He waters it every day.
Everyone says, "What pretty __8__ you have in your garden, Bob."

8. tomatoes berries vegetables flowers

The boy wanted to cross the street.
He saw a car coming.
He waited until the __9__ went by.
Then it was safe to __10__.

9. car people time piece
10. look cross skip play

Who wants to help the __11__ plant a tree?

11. kitten teacher dog horse

The birds are flying north.
The snow is gone.
The flowers are coming.
It is __12__.

12. spring summer fall winter

Dick can run fast.
Tom can run faster than Dick.
Tom and Dick ran a race.
__13__ won the race.

13. he they Dick Tom

Go on to the next page.

TEST 1 *Paragraph Meaning* (Continued)

One day when Jane went downtown with her mother she got lost. She saw a policeman on the street corner. She said, "Will you help me find my __14__?" He said, "Yes." A __15__ will always __16__ you if you ask him.

14. mother father purse doll
15. person stranger policeman man
16. answer help find tell

John's new toy has wheels.
It has cars.
It runs on a track.
It is a __17__.

17. train cart wagon bicycle

Jimmy had a pencil and a pen.
He had no ink.
So he had to write with his __18__.

18. paint pencil crayon fingers

I am good to eat.
I am yellow and white inside.
I have a shell outside.
I am an __19__.

19. apple orange egg onion

Mother said, "Fruit is good for children." She gave us an apple and an orange.

Mary ate the orange and I ate the __20__.

Mother said, "You both like __21__, don't you?"

20. peach fruit apple seeds
21. apples oranges fruit candy

I listen to the Answer Man on the radio. Once I sent in a question. He __22__ it three days later.

22. did answered told said

Our dog Sport and the cat are good friends.

When Sport has his supper, he lets the __23__ eat out of his dish.

When the cat has her dish of milk, she shares it with __24__.

23. children cat dog goldfish
24. Sport baby me others

The postman brings Helen's mail. Mary wrote a letter to Helen and mailed it. The next day __25__ saw the postman coming to her house with a __26__ in his hand.

25. he they Mary Helen
26. paper package letter toy

I rode my bicycle down a hill. It was fun to go fast. Then I struck a rock and fell and hit my head. Mother said, "You will be more __27__ next time. You will not __28__ down a hill in such a hurry."

27. foolish careless safe careful
28. fall run ride tumble

Dangerous fires are often caused by careless burning. A bonfire in the back yard can send out __29__ that will cause a house to __30__ down. A campfire can set off a blaze that may destroy a great __31__.

29. smoke sparks heat light
30. fall run melt burn
31. forest house tree country

Go on to the next page.

TEST 1 *Paragraph Meaning* (Continued)

It was a lovely sunny morning. Bob and Betty were happy as they piled baskets of good things to eat into the car. __32__ were going on a __33__.

32. **The girls** **The boys** **They** **The men**
33. **train** **picnic** **boat** **horse**

In Holland, instead of seeing boats on the canals in winter, you see hundreds of persons skating on the ice. Children __34__ to school because it is so much more fun to skim swiftly over the frozen canals than to __35__ slowly along the paths and roads.

34. **go** **run** **skate** **sail**
35. **walk** **ride** **play** **hop**

The Smith family has three children: Jane, Ellen, and Jim. Each child has a job to do every morning. Jane sets the table. Jim sweeps the walk. __36__ dries the dishes. The __37__ of the family work indoors and the boy works __38__.

36. **Jane** **Ellen** **Jim** **Mother**
37. **girls** **boys** **parents** **children**
38. **hardest** **most** **indoors** **outdoors**

An apiary is a place where bees are kept, and an aviary is a place where birds are kept. John loves birds. Someday he hopes to have his own __39__. Tom keeps bees in his __40__ and sells the honey made by his __41__.

39. **hive** **home** **aviary** **apiary**
40. **garage** **bedroom** **aviary** **apiary**
41. **bees** **birds** **pets** **flowers**

Long ago a king named Bruce had been defeated six times by another king who wanted to take Bruce's country away from him. One day as Bruce lay resting and thinking, he saw a spider trying to weave her web. Six times she tried to throw the thread from one beam to another and six times she failed, but the __42__ did not lose hope. She __43__ again and this time she succeeded. "I too will try a seventh time," said __44__. This time he defeated the other king.

42. **animal** **spider** **man** **king**
43. **tried** **jumped** **spun** **swung**
44. **the spider** **he** **she** **Bruce**

My grandmother had a jelly cupboard because she thought it was not easy to buy good jelly in stores. She had her own fruit trees and berrybushes. Every summer she picked the fruit and berries and put up many glasses of __45__ to store in her __46__.

45. **fruit** **berries** **juice** **jelly**
46. **cupboard** **kitchen** **cellar** **pantry**

Ned's birthday comes in May. Bill's birthday comes in March. They were born in the same year. __47__ is a little older than __48__.

47. **Mother** **Father** **Ned** **Bill**
48. **Mother** **Father** **Ned** **Bill**

Stop.

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Gr. score	12	13	13	14	15	15	16	17	18	18	19	20	20	21	22	23	23	24	24	25	25	26	27	27	28	29	30	31	32	32	33	34	34	35	35	36	36	37	39	40	42	43	45	48	52	57	64	71

TEST 2 *Word Meaning*

DIRECTIONS: Draw a line under the one word that makes the sentence true, as shown in the first sample. Look at all four words and choose the best one.

SAMPLES:

A cat can
paint bark read jump

The name of a color is
farm milk red pet

1 "Bow-wow," said the
deer rabbit squirrel dog

2 We get eggs from
cattle chickens horses pigs

3 We can look out of a house by looking through a
window wall table chair

4 A mother and father with a child are a
family party picnic crowd

5 Mr. Smith is a
boy girl man woman

6 We can hear a
house path star bell

7 At the grocery store Mother buys
shoes cookies toys nails

8 Many gardens have
flowers barns rivers woods

9 Ice is made from
plants water salt glass

10 A kitten can
smile drink talk laugh

11 When it rains the ground gets
hard warm wet new

12 Hair grows on the
ears feet head nose

13 A gun goes
bang-bang fast far away

14 A yard is outside a
track town country house

15 A king is always a
doctor girl man husband

16 If you own a toy, it belongs to
anyone everyone you a friend

17 April is a
day week month year

18 A forest has many
rooms mountains houses trees

19 The post office sends out
telegrams mail freight broadcasts

20 Sugar is
sweet salty bitter sour

21 A child who grows becomes
lazy thinner taller shorter

22 To speed is to go
first fast across slowly

23 When we study we
think play dream wish

24 Silk is a kind of
paint music wood cloth

25 To start is to
begin run stop come

26 To catch means to
chase get hit see

27 We get beef from
cattle horses pigs chickens

28 Near means
today between deep close

29 A wife is a woman who is
grown up old young married

30 A beast is
an enemy an animal a person a bird

31 To sparkle means to
smile attempt shine command

32 In order to have a school there must be a pupil and a
book desk building teacher

33 Moist means
temperate damp weather cold

34 If a person fails, he is
dull bad unsuccessful proud

35 Clay is mostly
earth glass soap water

36 Rapid means
quick strong light short

37 To furnish means to
supply finish teach study

38 To roam is to
rent reach walk wander

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Gr. score 13–	13	13	14	15	16	16	17	18	19	20	21	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	34	35	36	38	40	42	44	48	52	58	64	

Stop.

TEST 3 *Spelling*

1. _____ 16. _____

2. _____ 17. _____

3. _____ 18. _____

4. _____ 19. _____

5. _____ 20. _____

6. _____ 21. _____

7. _____ 22. _____

8. _____ 23. _____

9. _____ 24. _____

10. _____ 25. _____

11. _____ 26. _____

12. _____ 27. _____

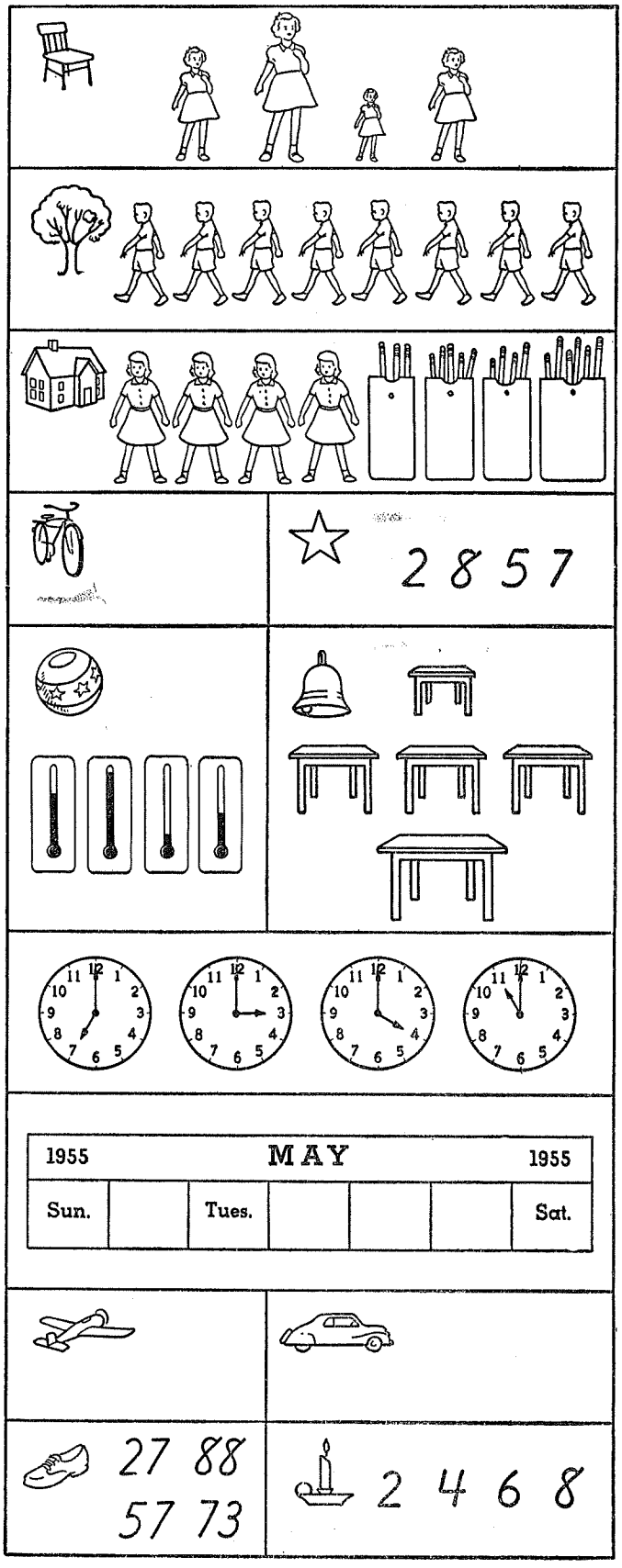
13. _____ 28. _____

14. _____ 29. _____

15. _____ 30. _____

No. RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gr. score	11–	11	12	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	35	37	39	41	43	46	49

TEST 4 *Arithmetic Reasoning*



14 How many rabbits are 2 rabbits and 1 rabbit? ------

15 One nest had 3 eggs and another had 5 eggs. How many eggs were in the 2 nests? ------

16 Jane saw 3 white horses, 2 black ones, and 3 brown ones. How many horses did she see all together? ------

17 There were 8 chairs for the reading group. The children took 3 to another room. How many chairs were left? ------

18 The milkman left 5 bottles of milk Monday. He left 2 yesterday and 2 today. How many bottles is this all together? ------

19 There are 9 songs in my music book. I have already learned 4 of them. How many have I still to learn? ------

20 We counted 23 cows in one field, 8 in another, and 9 in another. How many cows did we count? ------

21 Alice has 7 dolls in each room. How many dolls are twice as many as 7 dolls? ------

22 Mary has done 14 problems and Ruth has done 8. How many more problems must Ruth do to equal Mary? ------

23 Two dimes and three nickels are how many cents? ------

24 Helen has 2 dozen pictures and Sue has 20 pictures. How many more pictures has Helen than Sue? ------

25 Mrs. Gray buys 79 cents' worth of groceries. How many cents change should she receive from a dollar bill? ------

Stop.

No. RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gr. score	below 10			10	11	12	13	15	16	18	19	21	23	25	27	28	30	32	33	35	37	39	42	45	48

TEST 5 *Arithmetic Computation*

DIRECTIONS: Get the answers to these examples as quickly as you can without making mistakes. Look carefully at each example to see what you are to do.

Addition:

2	4	4	3	5	1	3	2	7	4	27	40
+2	+1	+4	+2	+2	+9	+5	+6	+3	+8	+41	+39
4											

Subtraction:

5	5	7	4	8	7	10	8	9	9	56	95
−4	−2	−5	−1	−7	−3	−6	−5	−4	−7	−23	−60
1											

Add 2 2 6	4 + 9 =	Add 84 +25	89 −24	Add 85 +2	68 −4
59 −53	Add 5 9 8 0	15 − 8 =	Multiply 8 ×2	Add 287 +460	2 × 6 =
Multiply 13 ×3	71 −29	138 −76	Add 234 52 +837	Multiply 204 ×2	618 −121
½ of 4 =	Divide 2)18	655 −379	Add $3.80 +9.63 $	Divide 3)126	600 −552

Stop.

No. right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Gr. score	10	11	13	14	14	15	16	17	18	18	19	20	21	22	23	23	24	24	25	26	26	27	27	27	28	28	29	29	29	30	31	32	33	33	34	35	35	36	37	38	39	40	42	44	47	50